CURRENT LITERATURE

BOOK REVIEWS

Heidenhain's "Plasma und Zelle"

The second part of HEIDENHAIN'S *Plasma und Zelle*[1] appeared early in 1911. While forming a part of BARDELEBEN'S *Handbuch der Anatomie des Menschen*, the section "Plasma und Zelle" is written from a remarkably broad standpoint, so that it is of general morphological and physiological interest.

In the first part,[2] issued four years ago, after a general discussion of the cell theory, the structure of the nucleus and of central bodies is taken up in detail, followed by an extensive critique of granular theories of protoplasm. Two leading tendencies give direction to the treatment of the subject matter: on the one hand, an attempt to break down the monopoly of the cell as the morphological and physiological unit; and on the other hand, more or less closely connected with this, an attempt to bring evidence for the existence of metamicroscopical units of structure, the *protomeres*. In this the author does not move in the realm of pure speculation, but is throughout concerned with arriving at conclusions establishing the existence and illuminating the nature of the metamicroscopical protomeres from a consideration of the organization and behavior of micro- and macroscopical structures. It is difficult to give in brief an adequate account of the materials and line of argument employed, and the reader is necessarily referred to the original.

The second part begins with a detailed treatment of the structure of the striated muscle, bringing together in a lucid fashion the mass of facts which has accumulated regarding this most complicated cytoplasm, doubly interesting because of the evident relation here between structure and function. A survey of this section again directs our attention to the meagerness of the data, a voluminous literature on the subject notwithstanding, regarding the histogenesis of the various structures of the muscle cell and its anomalous position with reference to information concerning the central body. It is the one conspicuous animal cell type in which even the mere presence of central bodies has not been demonstrated.

In discussing the relative solidity of various elements of the muscle cell, the author points out that the alternative *solid* or *liquid* does not put the question regarding the aggregate condition of cell constituents. He suggests

[1] HEIDENHAIN, M., Plasma und Zelle. Zweite Lief. pp. vi+604. Jena: Gustav Fischer. 1911.

[2] ———, Plasma und Zelle. Erste Abt. pp. viii+506. Jena: Gustav Fischer. 1907.

the conception of the *organized*, in which the elementary component particles maintain within certain limits definite relations to each other, although the structure as a whole may be highly plastic, as contrasted to the *fluid*.

It is to be regretted that the author did not feel warranted in giving a digest of the available data, such as they are, regarding the changes which take place in the structure of the striated muscle cell during contraction.

In connection with the discussion of the smooth muscle, the theory of short waves of contraction is developed. Whereas in the striated muscle the contraction wave has a length many times that of the muscle cell, in the smooth muscle it is but a fraction of the length of the cell. If contraction waves start simultaneously in all the fibrillae of a cell and keep step as they advance, the contraction knot of any fibrilla comes close to those of its neighbors, with a result that a more or less complete diaphragm is formed across the cell which, as it moves along, pushes the more liquid contents before it; a conception which HEIDENHAIN made use of in accounting for protoplasmic streaming in plant cells, and which has not been weakened by PFEFFER'S and RHUMBLER'S criticisms. The same conception is applied in a convincing manner to the movement of granules in pigment cells, and the suggestion is made that a similar situation obtains in dividing cells, resulting in the zonated appearance often observed in astrospheres. A further interesting application of the theory of short waves of contraction is made in discussing the contraction of cilia.

The section on the nervous substance brings together in an extensive but easily accessible manner the leading data on this highly complicated subject, which is of such importance to the cell theory. The author comes out unequivocally in favor of the neuron theory, a gratifying result for the adherents of this theory, especially since the standpoint of the author noted above would have made him keen to use any possible evidence against the cell theory. In the introduction a word is spoken for the importance of psychic processes as psychic processes in the economy of organisms and not as by-products of physico-chemical changes in the nerve substance. Considerable attention is given to the relation between nucleus and cytoplasm in the nerve cell. An interesting conclusion regarding the relation of the nucleus to regenerative processes in the protoplast results from the facts observed in the regeneration of a severed nerve fiber. Here, as in other known cases, repair proceeds from the nucleated portion of the cell, the other disintegrating. In the nerve fiber the cut surface may be a meter removed from the nucleus, so that a direct transportation of material from the nucleus to the region of injury is practically excluded, the action of the nucleus apparently being a dynamical one. The author also argues in favor of the "Tigroid" as a cytochromatin, an accessory chromatin developed in consequence of the huge cytoplasmic portion of the nerve cell.

A concluding chapter discusses the filar theories of protoplasmic structures and related matters.

The work contains an abundance of suggestions and information bearing

on the problems engaging the plant physiologist and morphologist. Mention should also be made of the wealth of excellent illustrations accompanying the text.—W. MARQUETTE.

The Eusporangiatae

CAMPBELL has published[3] a summary of the present knowledge concerning the morphology of the Ophioglossaceae and the Marattiaceae. His own studies of these forms have extended through twenty years, and his opportunities for observing and collecting tropical material have been unusual, so that such a summary is extremely valuable in bringing together the author's results and conclusions. The chief interest connected with this assemblage of plants is that in all probability it represents in the present flora the very ancient group which gave rise to seed plants. The main thesis of the work, however, is that Ophioglossaceae and Marattiaceae are genetically related, and that species of *Ophioglossum* are to be regarded as the most primitive forms of this assemblage, and in fact the most primitive living vascular plants. There is hardly room for difference of opinion today as to the close relationship that exists between the Ophioglossaceae and the Marattiaceae, and it is time to remove the Ophioglossaceae from their isolation as Ophioglossales, and to associate them with Marattiaceae as eusporangiate Filicales. As to the extremely primitive character of *Ophioglossum* and its relatively direct connection with the bryophytes, there is room for considerable difference of opinion.

The connection of *Ophioglossum* with bryophytes of the *Anthoceros* type is presented fully and skilfully. In embryogeny, the Eusporangiatae are characterized by the late development of the vegetative organs, as contrasted with the leptosporangiates, so that the young sporophyte is much more fully developed before it becomes independent of the gametophyte. In fact, several roots and leaves may be developed before independence, and in some cases even spores are formed before the two generations become completely separate. Moreover, the young sporophytes of *Ophioglossum* and *Anthoceros* resemble one another in appearance, with the massive foot in both cases, and the spore case of the latter represented by the cotyledon of the former. The author sees in this cotyledon, now sterile, a "pro-*Ophioglossum*" with a sporangiferous cotyledon, and with a stemless body, consisting of only leaf and root, the latter feature still being true of *O. moluccanum*. Of course the so-called "imbedded" sex organs of *Anthoceros* have long been recognized as a pteridophyte feature. The sperms of *Anthoceros* and *Ophioglossum* are regarded as perhaps the greatest obstacle, but if pteridophytes have been derived from bryophytes, that obstacle was overcome somewhere, either outside of the group or within it.

In reference to the subterranean gametophyte, which characterizes both

[3] CAMPBELL, D. H., The Eusporangiatae, the comparative morphology of the Ophioglossaceae and Marattiaceae. Carnegie Institution of Washington, Publ. no. 140. pp. vi+229. *pls. 13. figs. 192.* 1911.